



west virginia department of environmental protection

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ENGINEERING EVALUATION/FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-3111B
Plant ID No.:	039-00007
Applicant:	Bayer CropScience LP
Facility Name:	Institute Site
Location:	Institute
NAICS Code:	325320
Application Type:	Modification
Received Date:	April 29, 2014
Engineer Assigned:	Edward S. Andrews, P.E.
Fee Amount:	\$4500.00
Date Received:	May 1, 2014
Complete Date:	May 14, 2014
Due Date:	August 13, 2014
Applicant Ad Date:	May 7, 2014
Newspaper:	<i>The Charleston Gazette</i>
UTM's:	Easting: 432.0 km Northing: 4,248.3 km Zone: 17
Description:	This application is for the installation of three 350 MM Btu/hr, natural gas fired boilers to replace the 3 existing coal-fired ones located in Power House No. 2.

DESCRIPTION OF PROCESS

Bayer CropScience LP (Bayer) owns and operates the Bayer CropScience Institute Site in Institute, West Virginia, which is a chemical manufacturing complex. The site is currently configured with one main steam plant (Power House No. 2). Power House No. 2 has three, 360 MMBtu/hr boilers with a steam output of about 225,000 pounds of steam per hour from each unit (Boilers 10, 11, and 12). This steam is needed to support the chemical manufacturing operation at the site. Due to downturns in the chemical manufacturing operation at the site, the demand for steam has seen a significant decrease over the past couple of years. In 2012, Bayer elected to permanently shut down Power House No. 1, which was configured with three, 180 MMBtu/hr gas-fired boilers. Once Power House No. 1 was shutdown, the site lost its flexibility to adjust steam output on short notice based on demand.

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Thus, Bayer installed two package units (Boilers 13 and 14) in January 2013. These units are used to provide supplemental steam on an as needed basis and to alleviate reliability concerns of the steam output from Power House No. 2. A third package boiler (Boiler 15) was installed in 2014 to ensure start-up of Boilers 13 and 14 in the event that Power House No. 2 completely shuts down without notice. Boiler Nos. 13, 14, and 15 are currently covered under Permit R13-3111A.

To resolve the reliability issues with the boilers in Power House No. 2 and prepare to ensure compliance with the Boiler MACT (Subpart DDDDD of Part 63), Bayer has elected to replace the units in Power House No. 2 with three package style boilers (Boiler Nos. 16, 17, and 18). These new boilers will be rated with a heat input of 350 MMBtu/hr for each unit and a steam output of 252,000 pounds per hour at 400 psi and 700⁰F. Each of these units will be fueled solely with natural gas and each one vented to a dedicated stack.

SITE INSPECTION

On October 9, 2013, the writer conducted an announced site visit of the Institute Site. The Bayer representatives were Ms. Connie Stewart, Ms. Linda Tennant, and Mr. Walter Martin. During this visit, the writer was briefed on the steam capacity and demand at the facility.

The visit focused on the two package units, Power House No. 2 and Power House No. 1. The visit of Power House No. 1 was limited to the outside perimeter of the structure. Bayer is in the process of dismantling the entire power house including the actual structure. At the time of the visit, the contractor was at the stage of assembling the containment barrier as part of the asbestos abatement process.

Currently, Bayer operates the two package units in a hot idle state to ensure the site tenants reliable steam flow at all times. These units are two 80 MMBtu/hr “O” style boilers that were manufactured in 1979 by Zurn. According to the records onsite, these units are configured with a maximum 15% flue gas recirculation system coupled with low-NO_x burners on May 21, 2010. Bayer had already installed Boilers 13 and 14 near a main steam supply header just north of Power House No. 1. This installation was allowed without first obtaining a permit under Consent Order CO-R13-E-2013-11.

Power House No. 2 consists of three 360 MMBtu/hr boilers that are located at the west end of the site. Typical steam demand at the site only calls for one of these units to be operated. In 2012, the Power House No. 2 experienced several equipment failures that reduced steam generating capacity to the point that management elected to install Boiler Nos. 13, 14, and 15.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The applicant used pollutant specific emission factors from Chapter 1.4 of AP-42 and manufacturer's data to estimate emissions from the replacement boilers. The writer reproduced the estimated emissions from one replacement boiler, which are presented in the following table:

Table No. 1 – Emission from One of the New Boilers using Natural Gas			
Pollutant	Emission Factor	Hourly Rate (lb/hr)	Annual Rate (tpy)
PM Filterable/Condensable Fractions	0.005 lb/MMBtu	1.75	7.67
PM ₁₀ Filterable/Condensable Fractions	0.005 lb/MMcf	1.75	7.67
PM _{2.5} Filterable/Condensable Fractions	0.005 lb/MMcf	1.75	7.67
Sulfur Dioxide (SO ₂)	0.6 lb/MMcf	0.202	0.88
Oxides of Nitrogen (NO _x)	0.0363 lb/MMBtu	12.71	55.67
Carbon Monoxide (CO)	0.0342 MMBtu	11.97	52.43
Volatile Organic Compounds (VOCs)	5.5 lb/MMcf	1.85	8.11
Total Hazardous Air Pollutants (HAPs)	1.9 lb/MMcf	0.64	2.8
Carbon Dioxide Equivalent* (CO ₂ e)	117.098 lb/MMBtu	40,984.30	179,511.23

* Based on factors and global warming potentials from Tables A-1, C-1, and C-2 of Part 98 published on Federal Register on November 29, 2013.

Table No. 2 –Maximum Annual Emissions from the 3 New Boilers	
Pollutant	Annual Potential of 3 proposed boilers (tpy)
PM	23.01
PM ₁₀	23.01
PM _{2.5}	23.01
SO ₂	2.64
NO _x	167.01
CO	157.29
VOCs	24.33
HAPs	8.4
CO ₂ e	538,533.69

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The applicant estimated the potential fugitive emissions associated with the natural gas supply line to the new power house. Applicant identified the components involved with this line would be 99 valves, 175 flanges and 257 connectors. To estimate the emissions, the applicant used the emission factor for the component from the Synthetic Organic Chemical Manufacturing Industry and the approximate composition of the natural gas by pollutant (VOCs and special pollutant - greenhouse gases). The total VOCs from the facility's natural gas supply line would be 322 pounds per year (0.16 tpy). Methane emissions from leaks would be 24,416 pounds (12.21 tpy). Methane emissions are classified as one the six greenhouse gases, which is defined in 40 CFR §86.1818-12(a). To determine the CO₂e of the methane emissions, the Global warming potential of methane from Table A-1 to Subpart A of Part 98, which is 25 times, is multiplied by the methane emissions. For this case, the supply pipeline has the potential to emit 305.25 tons of CO₂e per year.

Overall, the emissions represented by this project are presented in the following table.

Table No. 3 –Emissions from the New Powerhouse	
Pollutant	Annual Potential (tpy)
PM	23.01
PM ₁₀	23.01
PM _{2.5}	23.01
SO ₂	2.64
NO _x	167.01
CO	157.29
VOCs	24.49
HAPs	8.4
CO ₂ e	538,838.94

REGULATORY APPLICABILITY

The Institute Site is a major source under Title V (45CSR30) and currently possesses a valid Title V Operating Permit. Under this program, new emission units have 12 months upon start-up to be incorporated in the facility's operating permit. The facility is currently classified as a major source for PM/PM₁₀/PM_{2.5}, NO_x, SO₂, CO, and VOC under Prevention of Significant Deterioration (PSD), Title V and for HAPs.

The first step in determining if the proposed modification has triggered a major modification of a major source is to determine which pollutants that the project is major for, which are illustrated in the following table.

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Table No. 4 Step One of PSD Applicability			
Pollutant	New Potential from the 3 Boilers (tpy)	Significance Threshold (tpy)	Significance Trigger (Yes/No)
PM	23.01	25	No
PM ₁₀	23.01	15	Yes
PM _{2.5} Direct	23.01	10	Yes
SO ₂ (& precursor for PM _{2.5})	2.64	40	No
NO _x (precursor of Ozone and PM _{2.5})	167.01	40	Yes
CO	157.29	100	Yes
VOCs	24.49	40	No

This project represents a “significant emission increase” (45CSR§14-2.75) for PM₁₀, PM_{2.5}, NO_x, and CO. The next step is to determine if this project results in a “net significant emission increase” pursuant to 45CSR§§14-3.4 and 2.80.c.

Basically, Boiler Nos. 16, 17, and 18 will replace the boilers located in Power House No. 2. Thus, the applicant selected the calendar years of 2005 and 2006 as the baseline period for NO_x to determine the past actuals (24 consecutive month period) which is in accordance with 45 CSR §14-2.8.

From Power House No. 2, the NO_x rate was 2,203 tons per year for 2005 and 1,959 tons per year in 2006. The baseline NO_x emissions were determined to be 2,081 tons per year. However, the baseline years selected for CO were 2012 and 2013. The CO rate from Power House No. 1 was 68 tons per year in 2012 and 72 tons per year in 2013, which make the baseline actual emissions of CO from Power House No. 2 to be 70 tons.

For PM₁₀, and PM_{2.5}, the baseline years for the boilers at Power House No. 2 were 2012 and 2013. These particulate matter emissions included filterable and condensable fractions.

Bayer has made several changes recently. Boiler Nos. 13 and 14 were added in 2013 and Boiler 15 in 2014. Bayer has elected to remove all three of these boilers as a result of this project. Since the start-up and shut-down of these units occurred during the contemporaneous period, the emissions increase and decrease from these units will cancel each other out and have no effect on the outcome of the analysis.

In 2011, Bayer added a Process Thermal Oxidizer (PTO) to control emissions from the Larvin® Process unit in anticipation of the removal of Boiler E480 (Located in Power House No. 1), which was used as a control device for the Larvin® process before adding the PTO. Since the addition of the PTO occurred within the contemptuous period, the potential emissions of PM₁₀, PM_{2.5}, NO_x, and CO were treated as increase in emissions for this analysis.

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Other changes that occurred during the contemporaneous period are the permanent shut-down boilers located in Power House No. 1 in 2012. Power house No. 1 included Boiler Nos. 3, 4, and 5 which were gas fired boilers with a heat input rating of 180 MMBtu/hr for each unit. The decreases from shutting down these units were obtained using the average of actual emissions that occurred in 2009 and 2010 for PM₁₀, PM_{2.5}, CO, and NO_x.

Table No. 5 Step Two of PSD Applicability					
Pollutant	New Potential from the 3 Boilers (tpy)	Baseline from Power House No. 2 (tpy)	PTO for Lavin (tpy)	Shutdown of Power House No. 1 (tpy)	Net change in Emissions (tpy)
NO _x (precursor of Ozone and PM _{2.5})	167.01	-2,081	40.4	-401	-2,274.59
CO	157.29	-70	2.81	-19	71.10
PM _{2.5}	23.00	-84.70	0.32	-0.09	-61.47
PM ₁₀	23.00	-96.40	0.32	-0.27	-73.35

Therefore, the net emission change in PM_{2.5}, PM₁₀, NO_x, and CO emissions for this project is less than the significance level for each corresponding pollutant and the project does not pose a net significant increase in emissions of any regulated pollutant under the PSD program. Thus, this proposed project is not classified as a major modification and no further review under Rule 14 is required.

With regards to the National Ambient Air Quality Standards, Kanawha County is classified as attainment for all criteria pollutants as of March 31, 2014. Thus, no review of this proposed project is required for applicability under Rule 19 (West Virginia's Non-attainment Permitting Rule) for this particular application. Therefore, this proposed project does not require a permit under PSD and/or Non-Attainment New Source Review.

Boiler Nos. 16, 17, and 18 are subject to Rules 2 & 10 (WV State Rules on PM and SO₂). The requirements from these rules and regulations are very minimal for natural gas fired boilers to comply with the applicable emission standards. These units will only be capable of consuming natural gas. It is understood that sources burning this fuel are significantly below the applicable allowable limitations in Rule 2 and Rule 10, which are the State of West Virginia's rules addressing particulate matter (PM) and sulfur dioxide (SO₂) from boilers, regardless of the size of the unit. This understanding is confirmed with the provisions in Rules 2A and 10A, which exempts such sources for conducting periodic testing and monitoring for the purpose of demonstrating compliance with the limitations under these rules. The permit will restrict the fuel type to these units to natural gas which would ensure compliance with the applicable emission standards of these rules.

These units are subject to the New Source Performance Standards of Subpart Db since each unit will have a design heat input rating of greater than 100 MMBtu/hr. Subpart Db establishes performance standards by pollutant by fuel type (i.e. coal, oil, and natural gas). For natural gas fired units, the subpart only establishes a performance standard for NO_x emissions. These units will be constructed after July 9, 1997 which makes the unit applicable to the limit in 40 CFR §60.44b(1) of 0.20 lb of NO_x (expressed as NO₂) per MMBtu. These units will be equipped with a low-NO_x burner with a maximum NO_x rate of 0.036 lb/MMBtu. At this NO_x rating, these units would have a margin of compliance of 18% of the applicable NO_x limit.

Subpart Db requires affected sources to demonstrate compliance with the NO_x limit on a 30 day rolling average. This subpart will require the use of a NO_x continuous emission monitoring system (NO_x CEMS) with a means to measure either O₂ or CO₂ in the exhaust for demonstrating compliance with the NO_x emission standard. The application states that NO_x CEMS will be installed to meet the Part 75 monitoring requirements, which is applicable under 40 CFR §60.48b(b)(2).

The facility is currently classified as a major source of HAPs, which means the facility has the potential to emit 10 tons per year of a single HAP or 25 tpy of total HAPs. Within the application, Bayer has not elected to determine if this project would change the facility's major source status for HAPs. Thus, the new boilers are subject to 40 CFR 63, Subpart DDDDD – National Emission Standard for Hazardous Air Pollutants (NESHAP) for Major Sources: Industrial Commercial, and Institutional Boilers and Process Heaters.

This regulation establishes work practices as a means to comply with the emission standards (see Item 3 of Table 3 to Subpart DDDDD of Part 63). Each of the proposed units will be equipped with oxygen trim systems to optimize the combustion air to minimize CO emissions. The rule recognizes this type of combustion control and defers the annual tune-up requirement to be performed once every five years in accordance with 40 CFR §63.7540. These boilers under Subpart DDDDD will be considered as new units. The one-time energy assessment is not required for new units. Therefore, the energy assessment is not applicable for these boilers and will not be included.

Bayer prepared and submitted a complete application, paid the filing fee, and published a Class I Legal ad in *The Charleston Gazette* on May 7, 2014. This project requires Notice Level C of 45CSR§13-8.5 be executed because of the emissions decreases that resulted from the shut-down of Power House No. 2 are required to avoid triggering permitting requirements under Rule 14, require. A sign must be posted at the facility and a commercial display ad published in conjunction with the Secretary's "notice of intent to approve".

The facility currently holds a valid Title V Operating Permit and included Attachment S of the application for a significant modification of this operating permit.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The new replacement boilers will not emit any pollutants that aren't already being emitted by another emission source at the facility. Therefore, no information about the toxicity of the hazardous air pollutants (HAPs) is presented in this evaluation.

AIR QUALITY IMPACT ANALYSIS

An air dispersion modeling study or analysis was not required, because the proposed modification does not meet the definition of a major modification of a major source as defined in 45CSR14.

MONITORING OF OPERATIONS

Rules 2 and 10 only require recording of the amount of natural gas consumed each month for natural gas fired boilers. However, these new units are subject to Subpart Db and the recordkeeping requirements in §60.49b(d)(1) requires daily fuel records. As noted earlier, these units are subject to the Boiler MACT which requires annual tune-ups for each boiler. The permit will require conducting an initial performance test for CO and conducting a tune-up every 5 years to optimize CO emissions. The permit will require the installation of oxygen trim systems which will minimize CO emissions based on actual oxygen readings at the outlet and trimming the combustion air damper. Bayer will be required to install and operate NO_x CEMS to demonstrate continuous compliance with the NO_x emission limit for each unit.

CHANGES TO PERMIT R13-3111A

The proposed changes to the permit do not affect the existing emission units except that Boilers Nos. 13, 14, and 15 will be permanently shut down within 180 days after start-up of the new units, which is incorporated into Condition 4.1.6.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates the proposed modification of the facility will meet all the requirements of the applicable rules and regulations when operated in accordance with the permit application. Therefore, the writer recommends granting Bayer CropScience a Rule 13 modification permit for their facility located in Institute, WV.

Edward S. Andrews, P.E.
Engineer

August 1, 2014
Date

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